

# Inventions & Innovation Project Abstract

## Advanced Pattern Material for Investment Casting Applications

Cleveland Tool and Machine (CTM) of Cleveland, Ohio in conjunction with Harrington Product Development Center (HPDC) of Cincinnati, Ohio have developed an advanced, dimensionally accurate, temperature-stable, energy-efficient and cost-effective material and process to manufacture patterns for the investment casting industry. The present method for investment casting is “The Lost Wax” process, which is exactly that, the use of wax as a pattern material, which is then melted out or ‘lost’ from the ceramic shell. The molten metal is then poured into the ceramic shell to produce a metal casting. This process goes back thousands of years and while there have been improvements in the wax and processing technology, the material is basically the same, wax.

Cleveland Tool and Machine’s technology is based upon an established industrial process of “Reaction Injection Molding” (RIM) where two components react when mixed and then ‘molded’ to form a part. The technology has been modified and improved with the needs of investment casting in mind. A proprietary mix of components has been formulated which react and expand to form a foam-like product. The result is an investment casting pattern with smooth surface finish and excellent dimensional predictability.

Cleveland Tool and Machine plans to develop and commercialize the technology that will result in energy savings of  $2,160 \times 10^9$  BTU’s per year in the investment casting industry (as a direct result of replacing the “The Lost Wax” method with the proposed FOPAT innovation). This will save approximately \$14M in energy costs per year as well an additional \$195M in material savings.



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